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PHSX 462.01: Quantum Mechanics II

Alexander P. Bulmahn

University of Montana - Missoula, alexander.bulmahn@umontana.edu

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PHSX 462: Quantum Mechanics II

Spring 2016

PROFESSOR:	Dr. Alex Bulmahn
OFFICE:	226 CHCB (inside of room 225)
PHONE:	243-2076
EMAIL:	alexander.bulmahn@umontana.edu
LECTURE:	MWF 12:10-1:00 pm, Charles H. Clapp Building 231
OFFICE HOURS:	T 11-12, W 1-2, F 11-12, and by appointment
TEXTBOOK:	<i>Introduction to Quantum Mechanics, 2nd Edition</i> David J. Griffiths
PREREQUISITE:	PHSX 461

Overview

This course will cover advanced topics in quantum mechanics, introducing approximate methods needed to analyze real systems. Topics include non-degenerate, degenerate, and time dependent perturbation theory, multi-particle systems, interactions of light with matter, and scattering theory.

Learning Objectives

Upon completion of this course you should have gained and understanding of:

- the formalism of time independent perturbation theory and how it applies to physical systems such as the hydrogen atom.
- the formalism of time dependent perturbation theory and how it applies to physical situations such as the interaction of light with atoms.
- multi-particle systems such as atoms, solids, and degenerate stars.
- the usefulness of the variational principle as an approximation method.
- scattering processes.

Grading

Your grade for the course will be based on weekly homework assignments, two in-class midterm exams, and a final exam. **Homework is due at the end of the day on the due date and late homework will be penalized 10% per day late (not including weekends and holidays).** **Make up exams will only be given in extreme circumstances.** The grading for the course will be broken down as follows:

Homework:	30%
Midterm Exams:	20% each (40% total)
Final Exam:	30%

This course can only be taken with the traditional grading option. The letter grades in this course will be based on a curve, giving you the grade that you earn. The curve will be determined by the performance of the class as a whole, but I do not have a set number of A's, B's, etc. predetermined. *Note: the last day to drop the course via Cyberbear is February 12th. The last day to drop the course without the Dean's signature is March 28th.*

Course Guidelines and Policies

Student Conduct Code

The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations. [Full student conduct code.](http://www.umt.edu/vpsa/policies/student_conduct.php)
(http://www.umt.edu/vpsa/policies/student_conduct.php)

Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and [Disability Services for Students](https://www.umt.edu/dss/default.php). <https://www.umt.edu/dss/default.php>
If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Tentative Schedule

Week	Dates	Topic	Reading and Notes
1	1/25—29	Non-degenerate Perturbation Theory	6.1
2	2/1—5	Degenerate Perturbation Theory	6.2
3	2/8—12	Applications of Degenerate Perturbation Theory, The Stark Effect	6.2
4	2/15—19	Addition of Angular Momentum, The Real Hydrogen Atom	4.4.3, 6.3
5	2/22—26	Zeeman Effect, Hyperfine Splitting	6.4, 6.5
6	2/29—3/4	Two-Particle Systems	5.1 Midterm Exam #1
7	3/7—11	Atoms	5.2
8	3/14—18	Solids	5.3
9	3/21—25	Variational Principle and Helium	7.1, 7.2
10	3/28—4/1	Time Dependent Perturbation Theory	9.1
11	4/4—8	SPRING BREAK—NO CLASS	Relax and Recharge
12	4/11—15	Emission and Absorption	9.2 Midterm Exam #2
13	4/18—22	Spontaneous Emission, Lasers	9.3
14	4/25—29	Scattering, Partial Wave Analysis	11.1, 11.2
15	5/2—6	Phase Shifts, The Born Approximation	11.3, 11.4
16	5/9—13	Finals Week Final Exam 10:10-12:10 pm, Monday 5/9	Exam in 231 CHCB